Analysis of the Genetic Potential and Gene Expression of Microbial Communities Involved in the In Situ Bioremediation of Uranium and Harvesting Electrical Energy from Organic Matter

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Abstract

The goal of this Genomes-to-Life project is to develop models that can describe the functioning of the microbial communities involved in the in situ bioremediation of uranium-contaminated groundwater and harvesting electricity from waste organic matter. Previous studies have demonstrated that the microbial communities involved in uranium bioremediation and energy harvesting are both dominated by microorganisms in the family Geobacteraceae and that these Geobacteraceae are responsible for the uranium bioremediation and electron transfer to electrodes. The research plan is diagrammed below. Examples of how both pure culture and environmental genomic studies have dramatically changed the concepts of how Geobacteraceae-dominated subsurface communities function will be presented.

Environmental Genomic DNA of “As-Yet-Uncultured” Geobacters  
Novel Culturing Strategies to Isolate Environmentally Relevant Geobacters  
Previously Cultured Geobacters  
Geobacter Genetic Potential  
Functional Genomics Elucidation of Regulatory Systems Analysis of Gene Expression Physiological, Biochemical Studies  
Analysis of Gene Expression in Relevant Environments with Environmental Genome Arrays and Proteomics  
In Silico Model of Cell Function  
In Silico and Conceptual Models for Optimizing Uranium Bioremediation and Electrical Energy Harvesting